



EPIDEMIOLOGY BULLETIN

VIRGINIA

E. Anne Peterson, M.D., M.P.H., Health Commissioner
Robert B. Stroube, M.D., M.P.H., State Epidemiologist

Elizabeth Barrett, D.M.D., M.S.P.H., Editor
Vickie L. O'Dell, Layout Editor

June 2000

Volume 100, No. 6

West Nile Virus

Background

The outbreak of West Nile virus (WNV) in the northeastern United States last year was an unprecedented event that shows signs of recurring in that area and has the potential to happen in other parts of the country, including Virginia. WNV is transmissible by mosquitoes and can cause febrile, sometimes fatal human and animal illness. It is a flavivirus belonging taxonomically to the Japanese encephalitis subgroup that includes the serologically closely related St. Louis encephalitis (SLE) virus, Kunjin virus, and Murray Valley encephalitis virus.

WNV has a wide geographic distribution and has caused human and animal disease outbreaks in Africa, southwest Asia, and Europe. Until the outbreak in New York in 1999, this virus had never been reported in the Western Hemisphere. It was first isolated in 1937 in the West Nile province of Uganda. The first recorded epidemics occurred in Israel during the 1950s. European epidemics followed in 1962 in southern France. Romania and Russia experienced epidemics in the 1990s.

The WNV transmission cycle involves mosquitoes and birds with human and non-human mammals as dead-end hosts. The mosquito vector species vary by area, and WNV has been isolated from 43 species of mosquitoes. Birds are the natural hosts for this virus and usually do not show any symptoms when infected. High, long-term viremia has been observed

in infected birds. In the U.S., individual specimens from 18 native bird species have tested positive for WNV. The number of bird species that became sick and died is one of the unique features of last year's outbreak. American crows appear most susceptible to the disease. As dead end hosts, mammals are less important than birds in maintaining the transmission cycle.

Recent History

Last year's outbreak came to the attention of public health officials when a New York City (NYC) infectious disease physician reported two cases of presumptive viral encephalitis to the NYC Health Department on August 23, 1999. Within a week, NYC public health officials had identified a total of eight encephalitis cases. The cases were initially attributed to SLE, but by the end of the year, 62 persons, including seven who died, had been confirmed with WNV.

The first human case had onset on August 2, 1999. The onset of the last human case was September 22, 1999. Active surveillance for human encephalitis cases in neighboring Connecticut and New Jersey did not detect any additional human cases. Cases had a median age of 68 years (range 5-90 years); only three cases occurred among children aged 16 years or younger. The seven deaths occurred among persons aged 68 to 87 years. The most commonly reported signs and symptoms among the 59 hospitalized persons included: fever (90%), muscle weakness (54%), headache (46%), altered mental status (44%), rash (22%), stiff neck (19%), arthralgia (17%), photophobia (15%), and myalgia (14%). Clinical presentations included encephalitis with diffuse muscle weakness (39%; median age, 75 years), encephalitis without muscle weakness (22%; median age, 71 years), aseptic meningitis (32%; median age, 60 years), and milder illness with fever and headache only (7%; median age,

65 years). The diffuse muscle weakness was characterized in several persons by flaccid paralysis and/or electromyographic evidence of axonal neuropathy. Initial diagnoses included Guillain-Barré syndrome and aseptic meningitis, as well as viral encephalitis. (The severe, diffuse muscle weakness appears to have been unique to the New York outbreak and had not been described in outbreaks in other countries.)

Specimens from human encephalitis cases

Criteria for Reporting Suspected Cases of WNV Infection in Humans:

Any adult or pediatric patient with viral encephalitis (criteria a, b, and c below) with or without associated muscle weakness (criteria d) should be reported to the local health department.

- Fever $\geq 38.0^{\circ}\text{C}$ or 100°F and
- Altered mental status (altered level of consciousness, agitation, lethargy) and/or other evidence of cortical involvement (e.g., focal neurologic findings, seizures) and
- CSF pleocytosis with predominant lymphocytes and/or elevated protein and a negative Gram stain and culture, with or without
- Muscle weakness (especially flaccid paralysis) confirmed by neurologic exam or by EMG.

were sent to the University of California, Irvine, for additional testing. All serum and cerebrospinal fluid (CSF) specimens reactive to SLE by IgM enzyme linked immunoassay (ELISA) were positive by WNV ELISA with higher positive/negative ratios than to SLE. Eight negative SLE samples were positive for antibody to WNV.¹

A seroprevalence study conducted at the epicenter of the outbreak estimated that approximately 2.6% of the population of northern Queens (553-1,903 persons) had been infected with WNV. These findings were similar to rates found in a comparable survey following a 1996 WNV outbreak in Bucharest, Romania.

In addition to the human cases, 25 horses on Long Island became ill with neurologic signs. Sixteen of these horses recovered, and the rest died or were euthanized. WNV was confirmed in three horses by viral isolation. Five horses died acutely (3-4 days post-onset) and did not have samples taken for viral isolation. Their WNV titers were negative, but it may have been too early in the clinical course for measurable antibodies to be present. The other horses had titers ranging from 1:100 to $\geq 1:1280$. Twenty-two asymptomatic horses also had antibodies to WNV.

At the same time that human cases were occurring, increased bird fatalities were observed, especially among free-ranging crows and captive native and exotic birds. Tissue specimens from birds with evidence of encephalitis were sent to the United States Department of Agriculture's National Veterinary Services Laboratories in Ames, Iowa, to be tested for common avian pathogens. When all tests were negative, samples were then submitted to the Centers for Disease Control and Prevention (CDC) on September 20 for identification. Three days later, CDC testing results indicated that there was a close resemblance to WNV.

Prevent Infection by West Nile Virus

Eliminate breeding sites of mosquitoes:

- **Remove tires, flower pots, and any other containers in which water can stand**
- **Punch drain holes in tires used as playground equipment**
- **Clean gutters, bird baths, potted plant trays and pet feeding dishes**
- **Empty unused swimming pools**
- **Maintain ditches so that water flows and does not stand**
- **When not in use, turn over wading pools and wheelbarrows**
- **Do not allow water to collect in garbage cans**
- **Adjust tarps over grills, firewood, boats and pools to eliminate standing water**

Protect yourself and your family members:

- **Avoid areas with mosquitoes**
- **Wear hats, loose fitting clothing with long sleeves and pant legs, and socks when outdoors**
- **Use mosquito repellants containing DEET on exposed skin and/or clothing (not underneath clothing)**
- **Follow label directions for repellant use**
- **Upon returning indoors, wash treated skin with soap and water**
- **Stay indoors at dawn and dusk when mosquitoes are most active**

Ultimately, over 200 birds from New York, Connecticut, New Jersey and Maryland died from WNV infection. Eighty percent were crows and jays, 10% were exotic species, and the remaining infections were distributed among 80 other North American species. One cat from New Jersey tested positive for the virus.

The mosquito species most often positive for WNV in NYC was *Culex pipiens*. In March 2000, mosquitoes that had overwintered in underground areas near where the 1999 NYC outbreak was centered were confirmed positive for WNV. In February of this year, a red-tailed hawk from Westchester County (north of NYC) was confirmed with

the disease. In June and July more positive birds were confirmed. At the time of publication, 11 crows and one more hawk have been reported from some of the previously affected counties of New York and New Jersey (Westchester, Rockland and Suffolk in

New York and Bergen in New Jersey), but none from NYC. To date no human cases or positive mosquito pools have been identified. The Atlantic coastal states may be at increased risk for WNV since they are along the migratory path of many bird species. It is not known what role migratory birds may play in the natural transmission cycle of WNV.

In 1999, Virginia submitted 51 birds (mainly crows) for WNV testing; all results were negative. In addition, over 73 serum samples from Virginia birds tested negative for WNV. One hundred forty-seven Virginia horses were submitted for necropsy to the Virginia Department of Agriculture and Consumer Services' (VDACS) Regional Animal Health Laboratory System; 12 of these had central nervous system (CNS) signs but were negative for WNV. Five humans were tested for WNV, as well as other arboviruses. No human case of any type of arboviral infection was reported in Virginia in 1999.

Clinical Signs and Symptoms

Human

After an average incubation period of 3-6 days, the onset is usually abrupt with flu-like symptoms such as fever, headache, myalgia, and lymphadenopathy. A pale roseolar maculopapular rash on the trunk and upper arms

APIC-Virginia 25th Annual Education Conference Capitalizing on the Challenge to Infection Control

Date: October 11 - 13, 2000

Location: Embassy Suites Hotel, Richmond Virginia

Contact: Janis Ober, RN, CIC

Medical College of Virginia Hospitals
Epidemiology and Infection Control Unit
1200 East Broad Street

West Hospital - 6th Floor, East Wing
Richmond, VA 23223
804-828-2121

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may appear from the second to fifth day. The illness is self-limited and lasts 3 to 5 days in 80% of patients. Infection may also result in aseptic meningitis or meningoencephalitis, especially in the elderly. Other rare complications include myocarditis, pancreatitis, and hepatitis. Healthy children and adults may not have any symptoms.

Animal

Animals usually shows signs of central nervous system disease such as ataxia, loss of coordination, an inability to rise, and even paralysis. Some affected horses in New York were febrile, as well.

Diagnosis

Human

Because the clinical presentation of WNV encephalitis is similar to that of encephalitis due to other viruses, a definitive diagnosis can only be made by laboratory testing using specific reagents. The ELISA cross-reacts with SLE and some other viruses and should

be viewed as a screening test only. During the first few days of illness, IgM antibody to WNV can be demonstrated in CSF by antibody-capture ELISA. CSF from patients with CNS involvement is clear with moderate pleocytosis and elevated protein. There is a slightly increased sedimentation rate and a mild leukocytosis.

Animal

Specific reagents for different species are in limited supply or not available, so testing of animals is not widely available. Tests for use in birds and horses are the most developed and include ELISA, viral isolation, virus neutralization, and polymerase chain reaction. In Virginia, animal testing is accessible only through the VDACS Regional Animal Health Laboratory System (RAHL).

Treatment and Prevention

There is no specific treatment for WNV. Supportive therapy to treat symptoms is the only treatment available at this time. Mosquito control is the most important prevention measure that can be taken. A trifold brochure and a fact sheet on West Nile virus can be downloaded at <www.vdh.state.va.us/epi/wnv.htm>.

Virginia Plan for 2000

A comprehensive plan for surveillance and response to WNV in Virginia has been prepared by the Virginia Interagency Arbovirus Task Force and is available from the Office of Epidemiology. It addresses bird, mammal, mosquito and human surveillance as well as mosquito control and dissemination of information to the public.

Birds

Sightings of dead and sick wild birds should be reported to the local health department. If the bird is a crow, jay or raptor that has been dead less than 24 hours, the local health department will facilitate transport of the carcass to a RAHL for triage and necropsy. Crows, jays and raptors for which no obvious cause of death is apparent will be tested for WNV. Groups of other species of wild birds that are dead or exhibit neurologic signs will be investigated by the VDACS Office of Pesticide Services to see if WNV testing is necessary. Illness and death among exotic birds or emus and ostriches should be discussed with the nearest RAHL.

Non-Human Mammals

Veterinarians who suspect viral encephalitis or rabies in a horse should call the nearest RAHL for advice on appropriate samples and disposition of the horse. Other mammals with signs of encephalitis should be appropriately investigated to eliminate all other possible causes of encephalitis before considering WNV. If WNV remains a possibility, the nearest RAHL should be contacted for further testing. Reagents for laboratory testing are limited, so only highly suspicious animals will be tested.

Humans

See box on page 1.

References

1. CDC. Outbreak of West Nile-like viral encephalitis, New York, 1999. *MMWR* 1999; 48:845-9.

Submitted by: Suzanne R. Jenkins, VMD, MPH, and Mary Jean Linn, RN, MURP, Office of Epidemiology.

Vaccine Information Statements

The National Childhood Vaccine Injury Act requires the most current CDC-prepared Vaccine Information Statements (VISs) be given by the vaccine provider (whether private or public) to either the adult vaccinee or to the child's parent/legal guardian at the administration of **each** dose of vaccine covered by the **National Vaccine Injury Compensation Program**. Hepatitis B, *Haemophilus influenzae* type b, varicella, measles, mumps, rubella, diphtheria, tetanus, pertussis, and polio vaccines are covered. The most recent Polio and Oral Polio Vaccine VISs (dated 1/1/2000) were mailed to private physicians in January. For a copy of the most recent VIS for any of the vaccines listed above, please call the Division of Immunization, Virginia Department of Health at 800-568-1929.

Birth Defects Prevention, a new brochure from the VDH Office of Family Health Services, is now available. Focusing on prevention and emphasizing the use of folic acid, the brochure is targeted toward women of childbearing age. In the last ten years, increased consumption of folic acid in women has correlated with a greater than 50% decrease in infants born with neural tube defects.

Brochures can be ordered by FAX (804-385-4996) or e-mail (dina.crowder@mssfulfillment.com) from Marketing Support Solutions. Ask for item number WIH-028.

For more information, call the VDH Division of Women's and Infants' Health, 804-786-5916.

Cases of Selected Notifiable Diseases Reported in Virginia*

Total Cases Reported, May 2000

Regions

Total Cases Reported Statewide,
January through May

Disease	State	NW	N	SW	C	E	This Year	Last Year	5 Yr Avg
AIDS	42	2	7	0	15	18	341	295	404
Campylobacteriosis	34	8	6	11	7	2	140	178	175
<i>E. coli</i> O157:H7	4	0	2	2	0	0	12	17	9
Giardiasis	27	7	8	7	2	3	158	127	127
Gonorrhea	604	22	22	45	198	317	4051	3848	3627
Hepatitis A	13	0	7	4	2	0	63	54	77
B, acute	10	0	2	2	3	3	60	40	47
C/NANB, acute	0	0	0	0	0	0	1	8	6
HIV Infection	51	1	8	0	14	28	318	265	368
Lead in Children [†]	53	6	4	7	16	20	147	138	204
Legionellosis	0	0	0	0	0	0	3	10	8
Lyme Disease	6	3	0	0	0	3	18	15	7
Measles	0	0	0	0	0	0	0	3	1
Meningococcal Infection	5	1	0	3	0	1	28	24	26
Mumps	0	0	0	0	0	0	4	8	6
Pertussis	5	0	1	0	1	3	15	13	10
Rabies in Animals	61	6	17	13	9	16	220	207	221
Rocky Mountain Spotted Fever	0	0	0	0	0	0	0	0	1
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	80	19	25	8	9	19	244	238	294
Shigellosis	33	0	9	22	1	1	66	29	105
Syphilis, Early [§]	16	2	2	5	1	6	124	163	315
Tuberculosis	35	1	17	3	4	10	108	105	134

Localities Reporting Animal Rabies This Month: Accomack 2 raccoons; Alexandria 1 raccoon; Appomattox 1 cat; Augusta 1 raccoon; Bedford 1 dog, 1 raccoon; Bland 1 fox, 1 raccoon; Campbell 1 raccoon; Chesapeake 1 raccoon; Craig 1 skunk; Dinwiddie 1 fox; Essex 1 raccoon; Fairfax 1 groundhog, 7 raccoons, 1 skunk; Floyd 1 skunk; Franklin County 1 raccoon; Gloucester 1 raccoon; Hanover 4 raccoons; Henrico 2 raccoons; Loudoun 2 foxes; Lynchburg 1 raccoon; Montgomery 2 raccoons; New Kent 1 raccoon; Newport News 1 raccoon; Northampton 4 raccoons; Page 1 raccoon, 1 skunk; Pittsylvania 1 raccoon; Prince William 1 fox, 4 raccoons; Rockingham 1 sheep, 1 skunk; Shenandoah 1 raccoon; Sussex 1 raccoon; Virginia Beach 1 fox, 3 raccoons; Williamsburg 1 raccoon; York 1 raccoon.

Occupational Illnesses: Asbestosis 16; Lead Exposure 15; Pneumoconiosis 11.

*Data for 2000 are provisional.

[†]Elevated blood lead levels $\geq 10\mu\text{g/dL}$. [§]Includes primary, secondary, and early latent.

Published monthly by the
VIRGINIA DEPARTMENT OF HEALTH
Office of Epidemiology
P.O. Box 2448
Richmond, Virginia 23218
<http://www.vdh.state.va.us>
Telephone: (804) 786-6261

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